



Faculty of Resource Science and Technology

**Distribution, Population Structure and Reproductive Biology of Nipa-
Obligate Crab *Labuanium politum* in Western Part of Sarawak**

Akma Iddin Bin Masini

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Distribution, Population Structure and Reproductive Biology of Nipa-
Obligate Crab *Labuanium politum* in Western Part of Sarawak

Akma Iddin Bin Masini

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DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgement has been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



Signature

Name : Akma Iddin Bin Masini

Matric No. : 17020052

Faculty of Resource Science and Technology

Universiti Malaysia Sarawak

Date : 05/10/2020

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ABSTRACT

Labuanium politum is a nipa-obligate arboreal crab and may be facing threats from human exploitation and habitat disturbance for socio-economic development in Sarawak. In addition, the ecology of this crab in their natural habitat are still unknown and it is crucial to balance the needs between resource utilisation and conservation. Therefore, this study was performed to i) document the distribution and population structure of *L. politum* at four nipa forest (NF) conditions based on human activity, ii) correlate selected environmental factors of NFs with *L. politum* population structure, iii) determine sexual maturity size (SM₅₀) of *L. politum* and iv) examine any form of parasitic infestation on *L. politum*. For the first objective, samplings were performed at selected NFs in three districts of Sarawak during daytime (15/04/2017–20/10/2018). The sites were then categorised into four conditions: i) managed NF, ii) managed NF with *L. politum* exploitation, iii) deforested NF and iv) undisturbed NF. It was observed that *L. politum* is not endemic since this crab were found from all NFs surveyed and majorities belong to 20–24 mm (28.39%) and 25–29 mm (31.17%) size classes while the minorities were recorded in 5–9 mm (1.23%), 10–14 mm (4.32%) and 35–39 mm (0.31%) size classes. Results showed that NF management via tree pruning seem to benefit *L. politum* populations which provide more green leaves and boost its food availability. In unmanaged nipa, the abundance of nipa palm tree was not affecting the *L. politum* population. For the second objective, the environmental parameters (total organic matter, sediment moisture, mud and air temperature and light penetration) at two different localities (Tambak and Tambirat) were measured simultaneously with crab collections for six month period (Jun-Aug 2017; Nov 2017-Jan 2018). Between localities, Tambak was significantly higher in mud temperature and light penetration, while Tambirat was significantly higher in sediment moisture. The carapace width (CW) ranged from 8.32–

33.64 mm (males) and 10.80–32.74 mm (females). The density and CW of *L. politum* were equal throughout sampling periods at each site and between both localities. Overall, Tambak samples dominated bigger CW size classes than Tambirat and males were dominating bigger CW size classes than the females but no sexual dimorphism was observed in the carapace shape. A significant negative correlation was observed between TOM and *L. politum* CW at Tambak, while other parameters were not correlated for both localities. However, this finding may not reflect the real case since the environmental parameters were not measured on daily basis. Based on the SM₅₀, Tambirat population achieved SM₅₀ in smaller size (male = 17.54 mm, female = 20.27 mm) than Tambak population (male = 23.28 mm, female = 21.99 mm) which could be due to higher human exploitation pressure at Tambirat. Correspondance Analysis showed crabs with DE stage were closely associated in July and August (50%) for Tambak and June (<40%) for Tambirat, thus the ideal harvesting time suggested should be in July onwards. Furthermore, the ideal harvesting size limit set at 75% total maturation was approximately >23.00 mm (Tambirat) and >26.00 mm (Tambak). This study had newly discovered branchial bopyrid isopod *Leidya distorta* infesting *L. politum* in Southeast Asia region. Only female isopods of various stages were found harbouring the *L. politum*. Higher prevalence occurred at Tambirat (4.46%) than Tambak (2.41%) but this infestation did not show fully castration effect towards its host.

Keywords: Sesarmid crab, nipa management, crab population, resource management, isopod parasite

Taburan, Struktur Populasi dan Reproduktif Biologi Ketam Obligat-Nipah; Labuanium politum di Bahagian Barat Sarawak

ABSTRAK

Labuanium politum adalah ketam pemanjat nipah dan menghadapi ancaman eksploitasi manusia dan gangguan habitat untuk pembangunan sosio-ekonomi di Sarawak. Tambahan pula, ekologi L. politum di habitat semula jadi masih belum terungkai dan adalah sangat penting untuk mengimbangkan penggunaan sumber dengan pemuliharaan. Oleh itu, kajian ini dilakukan untuk i) mendokumentasikan taburan dan struktur populasi L. politum pada empat keadaan hutan nipa (HN) berdasarkan aktiviti manusia, ii) menghubungkan faktor persekitaran HN yang terpilih dengan struktur populasi L. politum, iii) menentukan saiz kematangan seksual (SM50) L. politum dan iv) mengkaji sebarang bentuk jangkitan parasit pada L. politum. Objektif pertama, penyelidikan dilakukan di tiga daerah di Sarawak pada waktu siang (15/04/2017–20/10/2018). HN ini kemudian dikategorikan kepada empat keadaan: i) HN yang terurus, ii) HN yang terurus dengan eksploitasi L. politum, iii) HN yang ditebang dan iv) HN yang tidak diganggu. L. politum tidak dikategorikan sebagai endemik kerana ia telah direkodkan di semua HN kajian dan majoriti lebar cangkerang (LC) tergolong dalam kelas saiz 20–24 mm (28.39%) dan 25–29 mm (31.17%) sementara minoriti dicatat dalam kelas saiz 5–9 mm (1.23%), 10–14 mm (4.32%) dan 35–39 mm (0.31%). Kajian menunjukkan bahawa pengurusan HN melalui penyantanan pokok nampaknya memberi manfaat kepada populasi L. politum yang menggalakkan pertumbuhan daun hijau dan meningkatkan ketersediaan makanan. Pada HN yang tidak diganggu, kepadatan nipah tidak mempengaruhi populasi L. politum. Objektif kedua, faktor persekitaran (bahan organik, kelembapan sedimen, suhu lumpur dan udara serta ketembusan cahaya) di dua lokasi yang berbeza (Tambak dan Tambirat) diukur serentak dengan pensampelan ketam

selama enam bulan (Jun-Ogos 2017; Nov 2017-Jan 2018). Perbandingan antara kawasan, Tambak lebih tinggi untuk suhu lumpur dan ketembusan cahaya, sementara Tambirat lebih tinggi untuk kelembapan sedimen. LC adalah 8.32–33.64 mm (jantan) dan 10.80–32.74 mm (betina). Ketumpatan dan LC *L. politum* adalah sama sepanjang tempoh penyelidikan di antara kedua-dua lokasi. Secara keseluruhan, sampel Tambak mendominasi kelas saiz LC yang lebih besar daripada Tambirat dan jantan mendominasi kelas ukuran LC yang lebih besar daripada betina tetapi tiada dimorfisme seksual ditunjukkan oleh bentuk cangkerang. Hubung kait negatif yang signifikan diperhatikan antara bahan organik dan LC *L. politum* di Tambak, manakala faktor lain tidak menunjukkan sebarang hubung kait. Namun, dapatan ini mungkin tidak menunjukkan keadaan sebenar kerana tempoh masa faktor persekitaran yang diukur adalah singkat. Berdasarkan SM_{50} , populasi Tambirat mencapai SM_{50} dalam ukuran yang lebih kecil (jantan=17.54 mm, betina=20.27 mm) daripada Tambak (jantan=23.28 mm, betina=21.99 mm) yang mungkin disebabkan oleh tekanan eksploitasi manusia yang lebih tinggi di Tambirat. Analisis korespondensi menunjukkan bilangan ketam matang penuh berkait rapat dengan bulan Julai dan Ogos (Tambak=50%) dan Jun (Tambirat=<40%). Oleh itu, masa penangkapan yang disarankan ialah pada bulan Julai dan seterusnya. Selanjutnya, had saiz tangkapan sesuai ditetapkan pada tahap 75% pematangan iaitu lingkungan >23.00 mm (Tambirat) dan >26.00 mm (Tambak). Kajian ini telah pertama kalinya merekodkan jangkitan isopod bopyrid *Leidya distorta* pada *L. politum* di rantau Asia Tenggara. Hanya isopod betina dari pelbagai peringkat dijumpai pada *L. politum*. Jangkitan lebih tinggi ditemui di Tambirat (4.46%) berbanding Tambak (2.41%) namun jangkitan tidak mengakibatkan kemandulan sepenuhnya terhadap ketam.

Kata kunci: Ketam sesarmid, pengurusan nipah, populasi ketam, pengurusan sumber, parasit isopod

TABLE OF CONTENTS

	Page
DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
ABSTRAK	v
TABLE OF CONTENTS	vii
LIST OF TABLES	xv
LIST OF FIGURES	xvi
LIST OF ABBREVIATIONS	xxiv
CHAPTER 1 : INTRODUCTION	1
1.1 Study Background	1
1.2 Problem Statements	3
1.3 Significant of Study	4
1.4 Objectives	5
CHAPTER 2 : LITERATURE REVIEW	6
2.1 Taxonomy of <i>Labuanium politum</i>	6
2.2 Morphological and Ecological Descriptions of <i>L. politum</i>	7
2.3 Nipa Palm Tree (<i>Nypa fruticans</i>)	8
2.4 Disturbance Towards Nipa Forest	9

2.5 Population Structure Studies of Mangrove Crabs	10
2.5.1 Density of crabs	10
2.5.2 Mean sizes	11
2.5.3 Comparisons between male and female crab	11
2.5.4 Sex ratio	12
2.6 Environmental Influences on Crabs	12
2.6.1 Temperature on growth	12
2.6.2 Canopy cover and moisture effect on crab population	13
2.6.3 Relationship between accumulation of organic matter and crab population	13
2.7 Reproductive Biology of Crabs	14
2.7.1 Reproductive organs for male and female crabs	14
2.7.2 Maturation stages for male and female crabs	16
2.7.3 Size at sexual maturity studies for crabs	17
2.7.3.1 Methods used for determining sexual maturation	17
2.7.3.2 Factors affecting crab maturation	19
2.8 Parasitism of Isopod Parasites, <i>Leidya distorta</i>	20
2.8.1 Taxonomy and morphological description of <i>L. distorta</i>	20
2.8.2 Life cycle and ecology of <i>L. distorta</i>	24

CHAPTER 3: DISTRIBUTION OF <i>Labuanium politum</i> IN WESTERN	25
PART OF SARAWAK NIPA FOREST BASED	
ON HUMAN ACTIVITIES AND NIPA DENSITY	
3.1 Introduction	25
3.2 Materials and Methods	26
3.2.1 Study sites description	26
3.2.2 Samples collection	28
3.2.3 Condition of nipa forest based on human activities	29
3.2.4 Condition of nipa forest based on nipa density along selected rivers	30
3.2.5 Data and statistical analyses	33
3.2.5.1 Distribution of <i>L. politum</i> in Western part of Sarawak nipa forests	33
3.2.5.2 Population size and catchability variations of <i>L. politum</i> within different type of human disturbance	34
3.2.5.3 Population size and catchability variations of <i>L. politum</i> at different nipa density	34
3.3 Results	35
3.3.1 Distribution of <i>L. politum</i>	35
3.3.2 Population size and catchability variations of <i>L. politum</i> among different types of human activity	37

3.3.3 Population size and catchability variations of <i>L. politum</i> at different nipa density	39
3.4 Discussion	40
3.4.1 Distribution of <i>L. politum</i>	40
3.4.2 Population size and catchability variations of <i>L. politum</i> among different types of human activity	41
3.4.3 Population size and catchability variations of <i>L. politum</i> at different nipa density	43
3.5 Conclusion	43
CHAPTER 4: INFLUENCES OF ENVIRONMENTAL FACTORS ON <i>Labuanium politum</i> POPULATION STRUCTURE AT TWO LOCALITIES OF NIPA FORESTS	44
4.1 Introduction	44
4.2 Materials and Methods	45
4.2.1 Sampling sites and study periods for both localities	45
4.2.2 Environmental factors	47
4.2.2.1 TOM Analyses	47
4.2.2.2 Moisture Analyses	48
4.2.3 Data and statistical analyses	48
4.2.3.1 Enviromental factors	48

4.2.3.2 Population structure of <i>L. politum</i>	49
4.2.3.3 Correlation between environmental factors with crab population	51
4.3 Results	51
4.3.1 Environmental factors between Tambak and Tambirat	51
4.3.1.1 Total Organic Matter, TOM (%)	53
4.3.1.2 Moisture content (%)	53
4.3.1.3 Mud temperature (°C)	53
4.3.1.4 Air temperature (°C)	54
4.3.1.5 Light penetration (LUX)	54
4.3.2 Population structure of <i>L. politum</i>	54
4.3.2.1 Density of <i>L. politum</i>	55
4.3.2.2 Size of <i>L. politum</i> , Log CW (mm) between months and localities	56
4.3.2.3 Size of <i>L. politum</i> , Log CW (mm) between sexes	56
4.3.2.4 Relationship of CW and CL between males and females	57
4.3.2.5 CW size class distribution based on localities	58
4.3.2.6 CW size class distribution based on sexes	59
4.3.2.7 Sex ratio and berried females	60
4.3.3 Correlation for environmental factors with <i>L. politum</i> density and CW size	61
4.3.3.1 Tambak population	61
4.3.3.2 Tambirat population	63
4.4 Discussion	65

4.4.1 Environmental factors	65
4.4.2 Population structure of <i>L. politum</i>	67
4.4.3 Relationship of environmental factors with <i>L. politum</i> populations	69
4.5 Conclusion	69
 CHAPTER 5: SIZE AT SEXUAL MATURITY OF <i>Labuanium politum</i>; IMPLICATIONS FOR RESOURCE MANAGEMENT	 71
5.1 Introduction	71
5.2 Materials and Methods	73
5.2.1 Dissection of crabs for gonad observation	73
5.2.2 Stages of gonadal development	73
5.2.3 Determination of <i>L. politum</i> SM ₅₀	75
5.2.4 Data and statistical analyses	75
5.2.4.1 Size of <i>L. politum</i> in different gonadal stages	75
5.2.4.2 Sex ratio of <i>L. politum</i> in different gonadal stages	77
5.2.4.3 Monthly frequency of crabs according to different gonadal stages	77
5.3 Results	77
5.3.1 Size of <i>L. politum</i> according to the different gonadal stages	78
5.3.2 Proportion of <i>L. politum</i> according to the different gonadal stages	81
5.3.3 SM ₅₀ for <i>L. politum</i>	82

5.3.4 Monthly frequency variations on <i>L. politum</i> according to different gonadal development stages	85
5.4 Discussion	88
5.4.1 Size of <i>L. politum</i> in between localities and sexes according to different gonadal stages	88
5.4.2 SM ₅₀ for <i>L. politum</i>	89
5.4.3 Frequency variations of <i>L. politum</i> according to different gonadal stages	90
5.4.4 Suggestions for ideal harvesting guideline	91
5.5 Conclusion	92
CHAPTER 6: INFESTATION OF BOPYRID ISOPOD <i>Leidya distorta</i> TOWARDS <i>Labuanium politum</i>	94
6.1 Introduction	94
6.2 Materials and Methods	95
6.2.1 Inspection for <i>L. distorta</i> parasitism	95
6.2.2 Measurement of <i>L. distorta</i>	96
6.3 Results	97
6.3.1 Infestation of <i>L. distorta</i> from external and internal observations	97
6.3.2 Taxonomy of <i>L. distorta</i> inspected	98
6.3.3 Prevalence of <i>L. distorta</i> infestation (%)	100
6.3.4 <i>L. distorta</i> infestation at Tambak and Tambirat	101

6.4 Discussion	103
6.4.1 Infestation of <i>L. distorta</i>	103
6.4.2 Prevalence and comparison infestation of <i>L. distorta</i> at Tambak and Tambirat	104
6.5 Conclusion	105
 CHAPTER 7: GENERAL CONCLUSION AND RECOMMENDATIONS	106
 7.1 General Conclusion	106
7.2 Recommendations and study limitations	108
 REFERENCES	110
 APPENDICES	130

LIST OF TABLES

		Page
Table 2.1	Size Range of <i>L. politum</i> Worldwide (Ng et al., 2015).	7
Table 2.2	Distribution of <i>L. distorta</i> Infesting <i>Uca</i> and <i>Ucides</i> spp. (Wunderlich et al., 2017).	20
Table 3.1	Location of Selected Nipa Forests in Three Districts of Sarawak Involved in this Study.	27
Table 3.2	Condition of Nipa Forest That Had Been Recognised Based on Types of Human Activity in Site.	29
Table 3.3	Descriptions of Sampling Sites Based on the Nipa Forest Density.	32
Table 3.4	Demographic Statistics for <i>L. politum</i> According to Sampling Sites at Three Districts.	35
Table 4.1	Comparison of Mean Environmental Factors Between Tambak and Tambirat Throughout Study Periods.	52
Table 4.2	Descriptive Statistic for Each Demographic Category of <i>L. politum</i> .	55
Table 5.1	<i>Labuanium politum</i> . Stages of Gonadal Development for Males and Females (Leme, 2005; Ikhwanuddin et al., 2014 and Muhd-Farouk et al., 2017).	73
Table 5.2	CW Size Range of Males and Females <i>L. politum</i> at Different Gonadal Stages Collected from Tambak and Tambirat.	77
Table 6.1	Record and Prevalence of <i>L. distorta</i> Infestation on <i>L. politum</i> .	100
Table 6.2	Comparisons of <i>L. distorta</i> Infestations at Tambak and Tambirat.	102

LIST OF FIGURES

	Page
Figure 1.1 Local Cuisine of <i>L. politum</i> in Saribas.	3
Figure 2.1 <i>Labuanium politum</i> . Showing a) Dorsal View, b) Ventral View of Male, c) Ventral View of Female, d) <i>L. politum</i> Roaming Outside the Hiding Stalks, e) <i>L. politum</i> Inside the Stalks, and f) Foraging Activity of <i>L. politum</i> on the Nipa Fronds at Night.	8
Figure 2.2 Reproductive Organs of Male Crab <i>Portunus sanguinolentus</i> Showing Testis, AVD = Anterior Vas Deferens, MVD = Median Vas Deferens and PVD = Posterior Vas Deferens (Adopted from Soundarapandian et al., 2013).	15
Figure 2.3 Reproductive Organs of Female Crab <i>Danielethus crenulatus</i> (Adopted from Farais et al., 2017).	15
Figure 2.4 Dorsal View of a Female (left column) and a Male (right column) of <i>Sylviocarcinus pictus</i> Showing Changes in Size and Colour of the Reproductive Organs at Different Stages. Immature Stage: a) Ovaries (ov) Had a Filiform Shape and Transparent Colour, b) Testes (te) and Vas Deference (vd) Had a Transparent Colouration and Gelatinous Aspect; Maturing Stage: c) Ovaries Had a Larger Volume, With The Colouration Ranging From White to Yellowish, d) Testes and Vas Deference Had a Whitish Colouration and Gelatinous Aspect; Mature Stage: e) Ovaries Showing an Increase In Size and an Orange Colouration, f) Testes and Vas Deference Increasing in Size and Volume; Spawned Stage: g) Ovaries Had a	17

Flaccid Appearance and a Pale Yellow Colouration (Adopted From Silva et al., 2011).

- Figure 2.5 *Leidya distorta*. Juvenile Female Specimen: A, Dorsal View; B, Ventral View; C, Head and Lamina View; D, Pleopods and Pereopods View; and E, Antennae and Maxilliped View. Where: BP, Biramous Pleopod; FLT, Frontal Lamina Truncate; HE, Head; MDP, Mid Dorsal Projections; MX, Maxillipeds; PE, Pereopods; UR, Uropod. Scale Bar = 2 mm (A, B and D), 1 mm (C and E) (Adopted from Wunderlich et al., 2017). 22
- Figure 2.6 *Leidya distorta*. Specimens Infesting *Uca spinicarpa* With Scale Bar = 1.0 mm (Adopted from Romero-Rodríguez et al., 2017). 22
- Figure 2.7 *Leidya distorta*. Adult Female Specimen: A, Head and Developed Dorsal Bosses; B, Marsupium Fully Expanded and Spherical; C, Pleopods; and Pleotelson; D, Pleopods. Where: DB, Dorsal Bosses; EM, Expanded Marsupium; HE, Head; PT, Pleotelson. Scale Bar = 2 mm (A and B), 1 mm (C and D) (Adopted from Wunderlich et al., 2017). 23
- Figure 2.8 *Leidya distorta*. Male Specimen: A, Dorsal View; B, Ventral View; C, Head View; D, Pair of Elongated Uropod. Where: AN, Antennae; HE, Head; PE, Pereopods; UR, Uropod. Scale Bar = 1 mm (A and B), 500 µm (C and D) (Adopted from Wunderlich et al., 2017). 23
- Figure 3.1 Sampling Sites for The Distribution of *L. politum* at Three Districts (Betong, Kota Samarahan and Kuching) in Western Part of Sarawak, Malaysia. 28

Figure 3.2	Traditional Sampling Gear to Collect <i>L. politum</i> , Locally Known as 'Pengait'	29
Figure 3.3	Condition of Nipa Forest Based on Human Activities in Sampling Sites a) Managed Nipa Forest for Sap Tapping b) Embankment, C) Port Construction, D) Human Settlements, E) Bridge Construction, F) Undisturbed and Unmanaged Nipa Forest.	30
Figure 3.4	High Density of Nipa Forests.	31
Figure 3.5	Medium Density of Nipa Forests.	31
Figure 3.6	Low Density of Nipa Forests.	31
Figure 3.7	Sampling Sites at Samunsam River from Upper to Lower Stream	32
Figure 3.8	Sampling Sites at Sekambal River from Upper to Lower Stream	33
Figure 3.9	Size Class Distribution of CW for Total <i>L. politum</i> Collected Through All Sampling Sites.	37
Figure 3.10	Sex Ratio in Each Size Class Distribution (CW) mm for <i>L. politum</i> . * Representing Significant Difference Between Sex Ratio, $\chi^2 < 0.05$.	37
Figure 3.11	Comparison of the a) Mean Log CW Size, (mm) and b) Catchability (ind/min) of <i>L. politum</i> Collected Within Four Different Conditions of Nipa Forest; Managed Nipa Forest (C1), Managed With Exploitation (C2), Deforested (C3) and Undisturbed (C4). Variables Does Not Share The Same Letter Were Significantly Different Based On Multiple Comparison, (Tukey and Dunn, $p < 0.05$).	38
Figure 3.12	Comparison of Carapace Width Size, Log CW of <i>L. politum</i> Through Different Density of Nipa Forests at Samunsam and Sekambal River.	39

Figure 3.13	Comparisons of <i>L. politum</i> Catchability Through Different Density of Nipa Forests at Samunsam and Sekambal River.	40
Figure 4.1	Two Localities Involved in Population Structure Studies of <i>L. politum</i> With Tambak = N 1°37'15.19" E 111°17'6.71"; Tambirat = N 1°29'14.53" E 110°43'26.13".	46
Figure 4.2	Layout of Sampling Plots in Each Localities.	47
Figure 4.3	Mean Density of <i>L. politum</i> collected Within All the Sampling Months Between Both Localities. Different Letters Represent Significant Different Between Both Localities and Sampling Months. (Friedman, $p > 0.05$).	55
Figure 4.4	Comparison of Log (CW) <i>L. politum</i> Between Tambak and Tambirat Throughout the Sampling Months. * Representing Significant Difference Between Localities and Different Letters Representing Significant Difference in Locality Throughout Sampling Periods (Bonferroni, $p < 0.05$).	56
Figure 4.5	Comparison of CW Size Based on Sexes and Localities. Different Letters Represent Significant Difference of the Variables (Bonferroni, $p < 0.05$).	57
Figure 4.6	Relationship of CW and CL for a) Male Tambak, b) Male Tambirat, c) Female Tambak and d) Female Tambirat of <i>L. politum</i> .	58
Figure 4.7	Number of Individuals of <i>L. politum</i> by Carapace Width (CW) Size Classes at Two Different Sampling Localities, Sarawak. * Representing Significantly Biased Proportions of Males and Females, (χ^2 Test, $p < 0.05$).	59

Figure 4.8	CW Size Class (mm) Distribution of Males and Females <i>L. politum</i> from a) Tambak and b) Tambirat. * Indicating Significant Different Between the Proportion of Males and Females (χ^2 Test, $p < 0.05$).	60
Figure 4.9	Sex Ratio of <i>L. politum</i> by Monthly and Occurrence of Berried Females at a) Tambak and b) Tambirat Throughout Study Periods.	61
Figure 4.10	Correlation Analysis for the Relationship of <i>L. politum</i> Density With a) TOM, b) Moisture, c) Mud Temperature and d) Air Temperature at Tambak Population.	62
Figure 4.11	Correlation Analysis for the Relationship of <i>L. politum</i> Size With a) TOM, b) Moisture, c) Mud Temperature and d) Air Temperature at Tambak Population.	63
Figure 4.12	Correlation Analysis for the Relationship of <i>L. politum</i> Density With a) TOM, b) Moisture, c) Mud Temperature and d) Air Temperature at Tambirat Population.	64
Figure 4.13	Correlation Analysis for the Relationship of <i>L. politum</i> Size With a) TOM, b) Moisture, c) Mud Temperature and d) Air Temperature at Tambirat Population.	65
Figure 5.1	Dorsal View of <i>L. politum</i> (Male) With Different Colours and Size of Reproductive Organs. a) IM Stage, b) INT A Stage, c) INT B Stage, d) DE Stage With T = Testes, VD = Vas Deferens and Scale Bar = 1.00 mm.	74
Figure 5.2	Dorsal View of <i>L. politum</i> (Female) With Different Colours and Size of Reproductive Organs. a) IM Stage, b) INT A Stage, c) INT B Stage, d) DE Stage With OV = Ovaries, and Scale Bar = 1.00 mm.	74

Figure 5.3	Comparison of Size of <i>L. politum</i> , Log CW in Different Stages of Gonad (INT A–DE) in Tambak. Variables Does Not Share the Same Letter Were Significantly Different (Tukey, $p < 0.05$).	78
Figure 5.4	Comparison of Size of <i>L. politum</i> , Log CW in Different Stages of Gonad (INT A–DE) in Tambirat. Variables Does Not Share the Same Letter Were Significantly Different (Tukey, $p < 0.05$).	79
Figure 5.5	Comparisons for Size of <i>L. politum</i> , Log CW Compared Between Both Localities in All Stages of Gonad (IM–DE Stages) by Two-Way ANOVA and Mann Whitney, $p > 0.05$.	79
Figure 5.6	Comparison for Size Between Sexes of <i>L. politum</i> Collected from Tambak. Different Letters Indicated Significant Difference Between the Variables (IM; Mann Whitney While INT B and DE; Bonferroni, $p < 0.05$).	80
Figure 5.7	Comparison for Size Between Sexes of <i>L. politum</i> Collected from Tambirat. Different Letters Indicated Significant Difference Between the Variables (IM; Mann Whitney, $p < 0.05$).	81
Figure 5.8	Comparison Number of Individuals of <i>L. politum</i> in Different Stages of Gonads Based on Different Localities. * Indicating Significant Difference Between the Variables (χ^2 Test, $p < 0.05$).	82
Figure 5.9	Size at Sexual Maturity of <i>L. politum</i> Male (Tambak) by Sigmoid Curve Derived from the Percentage of Mature Individuals With CW Size, Where $SM_{50} = 23.28$ mm.	83

Figure 5.10	Size at Sexual Maturity of <i>L. politum</i> Female (Tambak) by Sigmoid Curve Derived from the Percentage of Mature Individuals With CW Size, Where $SM_{50} = 21.99$ mm.	83
Figure 5.11	Size at Sexual Maturity of <i>L. politum</i> Male (Tambirat) by Sigmoid Curve Derived from the Percentage of Mature Individuals With CW Size, Where $SM_{50} = 17.54$ mm.	84
Figure 5.12	Size at Sexual Maturity of <i>L. politum</i> Female (Tambirat) by Sigmoid Curve Derived from the Percentage of Mature Individuals With CW Size, Where $SM_{50} = 20.27$ mm.	84
Figure 5.13	Frequency Variations of <i>L. politum</i> Collected in Tambak Throughout All Sampling Months.	86
Figure 5.14	Frequency Variations of <i>L. politum</i> Collected in Tambirat Throughout All Sampling Months.	86
Figure 5.15	Correspondence Analysis CA Between Frequency of <i>L. politum</i> from Tambak at Different Gonadal Stages (IM, INT A, INT B and DE stages) With Sampling Months.	87
Figure 5.16	Correspondence Analysis CA Between Frequency of <i>L. politum</i> from Tambirat at Different Gonadal Stages (IM, INT A, INT B and DE stages) With Sampling Months.	88
Figure 5.17	Conditions of Nipa Forest at the Sampling Localities, a) Tambak and b) Tambirat.	91
Figure 6.1	<i>L. distorta</i> by Its Main Body Parts as Reference Point in Doing Size Measurement, Head (HD), Pereon (PE) and Dorsal Bosses (DB); Scale Bar = 2.00 mm.	96